

**BP Control Systems Issues Documents**  
**APPENDIX F TO EXPERT REPORT OF MIKE SAWYER**

<b>LATEST DATE ON EMAIL(S)</b>	<b>BC#</b>	<b>EMAIL SUBJECT TITLE</b>	<b>DESCRIPTION</b>
8/21/08	BPEP_ABB_03586679-6681	RE: Atlantis --- SBC RAC update	Email chain discussing replacement of failed boards and when it will be done. Snow says "need to get FMC out pretty quick to replace SPCU2 SBC2B." "If the other board decides to give up we'll be in a bind." No spare boards. Also discusses failed board for dc113/114, and 113 AMV issue.
8/21/08	BPEP_ABB_03586694	RE: DC113 Software Upgrade and Failed Card Installation	Berger email to FMC: "Since we have to go offshore and replace the bad SBC for DC113/114, B side, we might as well do the software change-out for the DC113 AMV external actuator out there as well...since by coincidence, the failed card is associated with DC113/114, the replacement card, can already have the new software loaded on it and tested by FMC."
8/21/08	BPEP_ABB_03586695-6696	FW: DC-122 information.	Berger email to Snow advising FMC is "convinced that SEM A on DC-122 is bad and possibly the culprit to the shut-in..." Says "we will need to replace the SCM on this well."
8/21/08	BPEP_ABB_03586773-6774 (Disc Exh 228 - Berger Depo)	RE: Honeywell screens	Email chain re: Honeywell screens not being what they should be, overview drawing not current in attempt to model subsea infrastructure, and what should be done so drawings are "revised to reflect current as-built subsea system."
8/22/08	BPEP_ABB_03586423-6427	RE: BP Atlantis Single Board computer Issues Meeting Minutes - 8/12/08	Long Email chain, including some e-mails from above, discussing the Atlantis SBC issues. Other emails in this chain also identified below, but final e-mail here from Broman says he discussed "the potentials of what could be hiding in the SCM and the wider implications to BP."
8/25/08	BPEB_ABB_03586257-6261	RE: BP Atlantis Single Board computer Issues Meeting Minutes - 8/12/08	Long Email chain, including some e-mails from above, discussing the Atlantis SBC issues. 8/21 email from Broman indicates he discussed w/FMC mgmnt who assured him they would get "heat cranked up" and he will continue to keep them on focus. Also states that "one item they seem to be getting to is the potential that the 122 SCM may have a SEM RAM issue similar to the ongoing recalls from FMC..." Kennelley answers this e-mail chain stating "this has the potential to shut you down if not aggressively managed..." and encourages Broman to keep on top of it.
8/26/08	BPEP_ABB_01518867-8869	Staff Meeting Notes	Duff e-mail with staff meeting notes address various controls issues.

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8/26/08	BPEP_ABB_03579591-9592 (Disc Exh 223 - Berger Depo)	RE: news on FMC Issues	Berger Email with Overview of Subsea control system single board computer failures (total of 7) and current status of what is being done.
8/26/08	BPEP_ABB_03668180	RE: Automation Techs on Atlantis	Email Chain from Thomas to Berger w attachment 08252008.zip appears to be fmc smart tool log files
8/28/08	BPEP_ABB_03579417-9419	RE: news on FMC Issues	Email chain forwarding Berger's overview e-mail above and comments re: same. "A number of the points below are also relevant to Angola Blk18 as we too have experienced control module failures and subsea comms issues." P. Martyniak. M. Worsley states he thinks control system problems should be dealt with on a more joined basis and that corporate should have a view in ensuring FMC brings "the correct level of resources to bear in resolving the problems."
9/2/08	BPEP_ABB_03657231-7233	RE: FMC SPCU/SCU Test Simulator	Email chain re test simulator established "to test the communications interface between the FMC SPCU and the Honeywell SCU...will provide mechanism to test individual SC and MVI boards.." Final email in chain from Cotton mentions procedure being written on how to configure the system for any subsea well, and that parts were borrowed for this system.
9/4/08	BPEP_ABB_03657038-7039	RE: This is my contact	Email chain re: having Emerson do a root cause analysis on failing boards vs FMC, and cost issues. Berger doesn't think BP should independently go to Emerson; that FMC needs to make the call to use Emerson or not. "access to money should not stop us as this is a systemic IM related issue, so if fmc sees value, but cost is impeding the progress i wonder if we should just move that way and sort out the \$ w fmc later."
9/5/08	BPEP_ABB)03656770	RE: Subsea Controls Comms Check	Oza e-mail update and Gipson response re: subsea controls comms check after Gustav (hurricane). "After the SPCU was started up...all the SEM A of all eight wells are not working...root cause of the failure...SPCU comms had timed out."
9/8/08	BPEP_ABB_03656612-6623	FW: This is my contact	Email chain providing Emerson service information on the root cause analysis of failing boards w-attached Overview of Root Cause Analysis. "Pricing for a root cause analysis is \$7500/board."



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9/8/08	BPEP_ABB_03656681	RE: Subsea Alarms	Email chain: "continuous alarms on DC-122 and DC-143 intrusive Sand Detection alarms on the Production jumpers." Advised by Oza to "turn off the alarms for the night." Berger says "should not be using the A side [line breaker] as we believe at this time that we have a faulty cpu ram in the sem." [NOTE: E-MAIL DATE SEQUENCE APPEARS INCORRECT IN THIS CHAIN]
9/9/08	bpep_ABB_03656435	Atlantis Subsea Test Rack and Comms	Cotton email to Oza etc. reporting on test system at FMC: "...system setup in a test lab that they use for other purposes so we need to meet with them to see what arrangements we can make so that we don't interfere with their other activities." Cotton says he is drafting outline of proposal to include: "Modify and test the logic to add the MVI comms failure to the ESD hydraulic trips on dual comms loss...Modify the graphics to clearly indicate when comms are lost for each individual well...provide training for automation personnel on how to swap cards...purchase a permanent test rack and test it? MadDog needs one of their components back next week."
9/10/08	BPEP_ABB_03657842-7843	Update on Atlantis TPU	Oza email to FMC updating on progress from 9/8 mtg. She states: "My major concern is that we are at risk of platform shutdown as we still don't know what has caused 50% of the boards to fail...1. A decision xtree, which I had asked FMC to develop on 4th Aug. This has yet to be developed by the Product group from Norway/Houston...All documents from the tests which has been carried out onshore and offshore is not collected to ensure and understand how the system could have failed." She wants to ensure the right amount of effort and focus to "resolve a possibility of total failure of the subsea comms and in turn impacting our production."

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9/17/08	BPEP_ABB_03481773-1775	RE: Updated: TPU Boards	Email chain re: various issues. Oza says SPCU1 drawing is out of date and she will forward as-built when she has. This is in response to request for update on August action items to produce map of which wells are supported by which cabinet and slot. Email chain also requests status of Norway TPU boards and SPCU Cabinet investigation procedure. In the chain, FMC also requests "a copy of the periodic maintenance procedure(s) for the topside control system on BP Atlantis."
9/18/08	BPEP_ABB_03654495-4496	RE: SPCU Hardware Diagnostic Procedure	Email chain w/Final email from Cotton indicating procedure looks good, and states the following: "The one thing that was unusual was the vibration on the cabinets." "...but the FMC cabinets were vibrating much more than would typically be found in an equipment/server room environment." "There have been several issues related to vibration so we should at least take a few readings. FMC or Motorola may have some environmental specs that include vibration."
9/19/08	BPEP_ABB_03654432-4433	FW: SPCU hardware diagnostic procedure	Email chain from McIntosh to Akkoca, cc: Oza & Reiff discussing addendum to the procedure; difficult to get an approved procedure out of Houston in time to carry work out tomorrow. Questions/comments: pertaining to would want some voltage over time within parameters; cabinets exposed to vibration - some testing appropriate; do cabinets require a ground? test the ground; interested in transient events? What happens when we lose power and then power back up. Can we simulate?; What happens when we power up/down the tem? surge internally?; Are the boards clear of wiring or other stuff?; Inspect each board to ensure they are fully seated w/o disturbing them? Test the boards in all slots to ensure they fit snug and can't be push down?



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9/22/08	BPEP_ABB_03630203-0204	RE: Smart Tool Logs	Email chain from Kamau responding to server failure messages. He indicates that Wells DC 121A, DC142A & B are not yet installed and communicating. DC122 SEM A Line 5A is deactivated on cabinet - getting message because DC122 SEM A has been deactivated and there is no response to this message from the SEM. Young discusses errors that FMC should look into while offshore: "There is a large quantity of network errors associated with 10.13.1.1 and 10.3.1.1 related to fastscanserver. These started after gustav and haven't stopped." "Sem A is the BAD sem and it should be left powered down by leaving the breaker open."
9/22/08	BPEP_ABB_03630237-0238	FW: BP atlantis TPU RCA	Email exchange between Akkoca/FMC & McIntosh/FMC forwarded to Oza & Fleming/BP discussing root cause analysis for failed TPU boards. Akkoca says info is intended for FMC internal use & needs processing before it is communicated to customer/BP, but it is forwarded to BP. FMC conclusion is "fan has probably not been running at all. However, TPU cards have been powered, and functionally running with more than a year with insufficient cooling." [NOTE: Email missing at bottom/origin of chain.]
9/23/08	BPEP_ABB_03629977-9978	DC114 DHG Data Problem	Email chain w/Final Email from Angel asking about correlation of the following problems and recent cabinet work: "Prior to...on 20-Sep, SEM-A DHG was reporting good data to ProcessNet, but has not reported good data since. Prior to...on 21-Sep, SEM-B DHG was reporting flat line data to ProcessNet, but has been reporting good data since then."
9/23/08	BPEP_ABB_03629981-9982	RE: DC113 AMV override installed and in operation	Email chain discussing the successful install of the AMV linear override actuator on DC113. "...allowed us to by-pass the leaking actuator on DC113 AMV and still operate the AMV valve..." Also brings up the DC114 downhole guages on SEM-A not reporting good data but the SEM-B are, this was not expected. They'll look into it.

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9/23/08	BPEP_ABB_03657657	Temperature Control in the SPCU cabinets	Email from Oza to various indicating investigation findings: Thermostats have been adjusted to 10 deg Celsius in order to keep the fans operating. No need for MOC as thermostats are working; have not been by-passed, change seen as calibration the thermostats.
9/24/08	BPEP_ABB_03629803	Atlantis TEM SBC Issues	Fleming Email reporting early indications from Atlantis TEM SBC root cause analysis is that boards may have been exposed to high temperatures caused by a problem with the cabinet cooling fans. Not conclusive but recommends getting FMC to ck Thunder Horse TEM cabinets to ensure theirs is working properly. Atlantis implementing temp MOC to have fans run continuously.
10/22/08	BPEP_ABB_03658747-8749	RE: Telecon to discuss BP Atlantis communication failures	FMC Email attaching Action Log for meeting review, and add'l attachments such as Decision Tree with Conditions of Satisfaction, SPCU Photos, Filter Photos, As Built Schematic SPCU, TPU Mapping, 3 Cabinets Info, Fault Tree and Norway Decision Tree.
10/22/08	BPEP_ABB_03658778-8779	RE: SCSSV info	Email chain re operating pressures for SCSSVs and those pressures shown on DC122 and DC123. 1st e-mail in chain from Oza: "I would like you chase up (sic) with Ron to find out whether the results from the PMs are within the allowable parameters." Chris Hui response e-mail says: "I see..15,000 on DC122 and 10,000 on DC123." Berger states: "The 15,000 on 122 is a bogus number. We have transmitter problems in that scm. The 10,000 is the better number."
10/28/08	BPEP_ABB_03665033-5044	[NOT AN EMAIL] Report, Root Cause Analysis (RCA), Subsea - Controls, SPCU 200/150 For BP Atlantis, TPU Communication Problem	Summary: Several of the TPU cards PN 100036467 stopped communicaiton in the SPCU cabinets located at BP Atlantis. This report contains the investigation to find reason for the fault and the suggested measures to avoid the fault in the future. Author: Ragnar Eretveit [no findings indicated]
11/3/08	BPEP_ABB_03667331-7332	Ambient Conditions in Generation Module	Email chain from Young: "The room containing the SPCU cabinets has the following characteristics: the relative humidity is between 38-39%, the temperature was 70.5F."



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11/6/08	BPEP_ABB_03666753	Re: DC123 Choke Problem	Email from Humphrey forwarding email from Angel which summarizes choke problems (trouble opening after unplanned platform shutdown). "It looks like a bad choke in development. This is an example that should go into DWF..."
11/13/08	BPEP_ABB_00095536-5538	FW: Gasket removal tools and spares for Atlantis - requisition coding error	Email chain ending w/Email from Abbott re: a specific and other requisition coding errors occurring. Abbott says problem needs to be addressed and resolved to eliminate rework and change orders.
11/17/08	BPEP_ABB_03665528-5529	PEI Action Item: DC123 Choke Problem	Email chain concerning Angel e-mail BPEP_ABB_03666753. Last e-mail from Angel in this chain states: "The problems we had recently with the DC123 are probably due to interference with the Fast Acting Module. ...we still need to change out the FAMs on 5 wells...Since the production losses due to FAM problems has been very low, I recommend we continue to look for opportunities to change the FAMs when the wells are shut in for other reasons, such as the jumper tie ins."
11/19/08	BPEP_ABB_00103866	RE: Well valve timing	[Does not make reference to any well.] Email chain from Ragan to Oza, "Dennis Sustala has requested some information for the MMS, and I don't have a good source for the timing. Our historian is currently set to collect valve position every 30 seconds, and that doesn't provide a good picture of the valve closure times."
11/19/08	BPEP_ABB_03665276-5280	RE: Telecon to discuss BP Atlantis Communication failures	FMC Email attaching action log 11 19; SPCU 200_150 PN vs QN_SN; 500000059845 ECN update of SPC-0000023993 to rev B, 500000059845 ECN update of SPC-0000023993 to rev C, SPC-0000023993_RevC_Control system SW BP Atlantis, ELD60008552, PRD-0000024233 for TC review
11/20/08	BPEP_ABB_03664978-4979	RE: BPAT SEM Time Watchdog	Email chain from Furneaux. He mentions he has looked through the 722 protocol, TPU to SPC interface. He indicates there is a PING command available for the MVI to use to check the connection status of TPU. This is in response to Nehra's email, "Dale said there could be an issue if the SEM time is used as a watchdog because if the SEMs are not communicating for any reason it would seem like the TPU is not working."

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11/20/08	BPEP_ABB_03664980-4981	RE: BPAT SEM Time Watchdog	Email chain from Cotton indicating "I asked Henry to move forward on the subsea comms MOC without the watchdog." "...and will not have time to work through this issue with FMC." "...that enable the ESD to dump the hydraulics on the HPU when dual comms are lost."
11/20/08	BPEP_ABB_03665027-5044	RE: Telecon to discuss BP Atlantis communication failures	FMC Email attaching SBC RCFA report comments BJY; Copy of BP action log 11 20 Robert Noe also asked "The question was asked offline if it would be possible to monitor the temp in the cabinet remotely (via HMI or Smart Tool)"
11/27/08	BPEP_ABB_03664106-4119	FW: Bridging Procedure for DC121 for USE	Email chain from Byrd with attached GC787-SS-062 DC 121 Test Bridging Doc FOR USE from Oza, Subject: Bridging Document for DC121 Tree Testing by PQ, email from Oza indicates "The major change is that we do no have DC122 SEM A available. We will be running DC122 blind..."
8/11/09	BPEP_ABB_01463415-3478	[NOT AN EMAIL] Report, Verification, Valves - Gate, 9-10 Fail As Is (FAI) Gate Valve Investigation Findings	[LOCATION OF VALVE TESTED IS NOT INDICATED IN THIS REPORT]. Report documents "testing performed on the 9"-10K Fail As-Is actuator at ambient temperature and the results found during subsequent disassembly... performed due to a pressure loss from the Control 1 chamber to the Control 2 chamber when the actuator is in the 'open' position." Resulted in generating QNs to address coating and assembly processes.
12/9/09	BPEP_ABB_01464418-4432	[NOT AN E-MAIL] BP Atlantis DC3 FMC/Protec Quality Notification, Test HPUs not per Specification, HPU, Pressure Regulated Test Assembly, Part No. P1000058784, SN 3557 (QN200143677) Document Number 1440-38-QA-CR-3000 Rev. A	Pg 2 of 14: "DESCRIPTION: Test HPUs not per Specification...Drawing...do not match delivered equipment...FMC never received updated drawings for approval...Nameplate does not include revision number of part as required per Q00501..."



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3/8/10	BPEP_ABB_00088942-8943	FW: EFL Locations - FMC vs. Technip Dwgs	Email Chain re comparison of FMC and Technip electrical drawings: "found several EFLs that did not have the same connection locations."; Final e-mail requests where detailed installation information resides, and asks that the pre-commissioning controls results be checked to establish what was recorded.
5/12/10	BPEP_ABB_01930185-0210	[NOT AN EMAIL] BP Atlantis DC1 FMC Report, Root Cause Analysis (RCA), Subsea Controls, TPU (Single Board Computer) Communication Problem at BP Atlantis	<b>Pg. 1 of 15: "This report contains the results from the investigation to find the root cause for these failures [SPCU intermittent and permanent communication drop-out] and the necessary correction actions to avoid these failures in the future." Pg. 3 of 15: "issue where the processors under certain conditions, including over temperature exposure, may experience increased risk of functional failure... specific failure mode is related to crosstalk between data lines on a data bus interconnecting the L-1 internal cache memory and the external L-2 cache memory on the board... adjustment of the thermostat controlling the cabinet cooling fans, has provoked the observed failure mode on the TPU boards." SEE ALSO PGS 5, 11, 12,13, AND 15.</b>
6/28/10	BPEP_ABB_03500435-0438	Preliminary Reliability Report - 1QTR 2010	Email from Gipson to Powell Etc attaching preliminary Equipment Reliability report for 1st quarter 2010. Attchmts from Excel Spreadsheet include: Reliability Charts, PEI Data, Maximo Costs Data, Maximo Top Problem Codes and Maximo Top Failure Codes. Email indicates: "DC131's jumpers were not properly inhibited. DC114 was shut down to form a hot oil circulation path." "eRTT Details: 1. VRU 1-1st Stage-47% availability and 47% reliability 2. VRU 2-2nd Stage-62% Availability and 75% reliability 3. Pax 1-37% Availability and 37% reliability 4. Pipeline Booster 3-56% Availability and 56% reliability 5. Tgen 3-65% Availability and 65% Reliability"

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12/15/10	BPEP_ABB_02176312-6317	[NOT AN E-MAIL] BP Atlantis DC1 FMC/Honeywell Service Notification, Failed BPAT TPU Board, Failed During Testing By Honeywell, Part No. P100036467, SN 0908374 (SN300249632) Document Number 1440-35-QA-CR-5021 Rev A.	Page 1: Start Date: 12/09/2010, Notification Date: 12/09/2010; End Date: 01/21/2011, Device Data: SER No 0908473. "BP Atlantis TPU board failed during testing by Honeywell group." Page 3 is a Certificate of Compliance dated 2/17/09 listing the above as one of the serial numbers in the Description of Goods.
UNDATED	BPEP_ABB_03658137	[NOT AN EMAIL] Steps taken during Root Cause Analysis (RCA)	One page document titled "Steps taken during Root Cause Analysis (RCA)." <u>MAY GO WITH BPEP_ABB_03656612 DATED 9/8/08 BUT BC SEQUENCE DOESN'T MATCH</u>